

Attachment 2

Oil and Hazardous
Materials/Technical Assistance Data
System

Americium-241

AMERICIUM 241

OHM/TADS - Oil and Hazardous Materials/Technical Assistance Data System

Developed by the Office of Water and Waste Management of the United States Environmental Protection Agency, 1985.

Document Outline

- 1.0 SUBSTANCES INCLUDED
- 3.0 TRANSPORT/STORAGE/HANDLING
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SUBSTANCES INCLUDED

Material name: AMERICIUM 241

CAS number: 14596-10-2

Chemical formula: AM

Tradename(s):

Production sites: AMERSHAM/SEARLE CORP., ARLINGTON HGTS, IL; BIONUCLEAR, HOUSTON, TX; CAPINTEC NUCLEAR, MT; VERNON, NY; EBERLINE INSTRUMENT CORP., SANTA FE, N.M. GENERAL ELECTRIC CO. (IRRADIATION PROCESS. OP.), PLEASANTON, CA; GENERAL NUCLEAR, INC., HOUSTON, TX; HIGH VOLTAGE ENGINEERING CORP., BURLINGTON, MA; INTERNATIONAL CHEMICAL AND NUCLEAR CORP., IRVINE, CA; ISOTOPE PRODUCTS LABORATORIES, BURBANK, CA; MONSANTO RESEARCH CORP., DAYTON, OH; NATIONAL BUREAU OF STANDARDS, WA; DC; NEW ENGLAND NUCLEAR CORP., BOSTON, MA; NUCLEAR ASSOCIATES, INC., WESTBURY, NY; NUCLEAR EQUIPMENT CHEMICAL CORP., FARMINGDALE, NY; NUCLEAR MATERIALS AND EQUIPMENT CORP., PITTSBURGH, PA; NUCLEAR RADIATION DEVELOPMENTS, INC., BRAND ISLAND, NY; NUCLEAR SUPPLIES, ENCINO, CA; ORTEC, INC., OAK RIDGE, TN; PARKWELL LABORATORIES, INC., CROTON, OH; RADIATION MATERIALS CORP., WALTHAM, MA; SWISS FEDERAL INSTITUTE FOR REACTOR RESEARCH TELEDYNE ISOTOPES, PALO ALTO, CA; TRACERLAB, WALTHAM, MA; UNIVERSAL RADIOISOTOPES, INC., RICHMOND, CA.

TRANSPORT/STORAGE/HANDLING

Handling:

General handling procedures: CFR TRANSPORT GROUP 1 - TYPE A MAX QUANTITY .0001 CI AND TYPE B MAX QUANTITY 20 CI; TYPE A QUANTITY MAY BE PACKAGED FOR SHIPMENT VIA AIR, HIGHWAY, RAIL, AND WATER IN FIBERBOARD BOXES AND DRUMS, METAL DRUMS AND WOODEN BOXES; TYPE B QUANTITY IN METAL DRUM. THE TOTAL CONTENT OF RADIOACTIVE MATERIAL DOES NOT EXCEED .0001 CI PER DEVICE OR .001 CI PER PACKAGE FOR MANUFACTURED ARTICLES HAVING RADIOACTIVE MATERIALS OTHER THAN LIQUIDS IN NONDISPERSIBLE FORM.

LABORATORY

Field detection limits (ppm): 3.E-5,GAMMA, BNW,

Laboratory detection limits (ppm): LESS THAN MPC IN WATER, GROSS ALPHA AND GROSS BETA COUNTING SAMPLE MAY REQUIRE CONCENTRATION BY DISTILLATION OR OTHER MEANS, (BNW C16)

PHYSICOCHEMICAL PARAMETERS

Physical parameters:

Location/state of material: 1. PURE ELEMENT IS SILVERY IN APPEARANCE 2. ALL COMPOUNDS EXCEPT AMF3 ARE SOLUBLE IN WATER WILL DISSOLVE

Boiling point (degrees C): 26

FIRE/EXPLOSION/CORROSION HAZARDS

Fire hazard:

Standard codes: LABELS FOR PACKAGES OF RADIOACTIVE MATERIALS MUST BE OF DIAMOND SHAPE, IN COLORS SPECIFIED, WITH EACH SIDE AT LEAST 4 INCHES LONG. PRINTING MUST BE IN BLACK INSIDE A BLACK LINE BORDER MEASURING AT LEAST 3 1/2 INCHES ON EACH SIDE. "RADIOACTIVE WHITE-I" LABEL -- LABEL MUST BE WHITE IN COLOR. THE SINGLE VERTICAL BAR ON THE LOWER HALF OF THE LABEL MUST BE BRIGHT RED IN COLOR. LABELS MUST BE APPLIED ON TWO OPPOSITE SIDES OF EACH PACKAGE HAVING A DOSE RATE NOT EXCEEDING .5 MILLIREM PER HOUR AT ANY POINT ON THE EXTERNAL SURFACE OF THE PACKAGE. NOT AUTHORIZED FOR FISSILE CLASS II PACKAGES. "RADIOACTIVE YELLOW- II" LABEL -- THE UPPER HALF OF THE LABEL MUST BE BRIGHT YELLOW AND THE BOTTOM HALF MUST BE WHITE. THE TWO VERTICAL BARS ON THE LOWER HALF OF THE LABEL MUST BE BRIGHT RED IN COLOR. LABELS MUST BE APPLIED ON TWO OPPOSITE SIDES OF: A) EACH PACKAGE HAVING A DOSE RATE NOT EXCEEDING 10 MILLIREM PER HOUR AT ANY POINT ON THE EXTERNAL SURFACE OF THE PACKAGE AND NOT EXCEEDING .5 MILLIREM PER HOUR AT 3 FEET FROM THE EXTERNAL SURFACE OF THE PACKAGE; OR B) EACH PACKAGE FOR WHICH THE TRANSPORT INDEX DOES NOT EXCEED .5 AT ANY TIME DURING TRANSPORTATION. "RADIOACTIVE YELLOW-III" LABEL -- THE UPPER HALF OF THE LABEL MUST BE BRIGHT YELLOW AND THE BOTTOM HALF MUST BE WHITE. THE THREE VERTICAL BARS ON THE LOWER HALF OF THE LABEL MUST BE BRIGHT RED IN COLOR. LABELS MUST BE APPLIED ON TWO OPPOSITE SIDES OF: A) EACH PACKAGE HAVING A SURFACE DOSE RATE EXCEEDING 10 MILLIREM PER HOUR; B) EACH FISSILE CLASS III PACKAGE; C) EACH PACKAGE CONTAINING A LARGE QUANTITY OF RADIOACTIVE MATERIAL AS: 20 CURIES OF GROUP I RADIONUCLIDES, 20 CURIES OF GROUP II RADIONUCLIDES, 200 CURIES OF GROUP III RADIONUCLIDES, 200 CURIES OF GROUP IV RADIONUCLIDES, 5,000 CURIES OF GROUP V RADIONUCLIDES, 50,000 CURIES OF GROUP VI RADIONUCLIDES, 500,000 CURIES OF GROUP VII RADIONUCLIDES, OR 5,000 CURIES OF SPECIAL FORM RADIOACTIVE MATERIALS; OR D) EACH PACKAGE TRANSPORTED UNDER A SPECIAL PERMIT ISSUED IN RESPONSE TO A PETITION.

Toxic combustion products: RADIOACTIVE COMBUSTION PRODUCTS

Personnel protection: ALPHA, GAMMA RADIATION. DO NOT ALLOW CONTAMINATED WATER TO COME IN CONTACT WITH SKIN OR PERSONAL CLOTHING. WEAR WATERPROOF PROTECTION. IF THE RADIOACTIVITY IS ALSO AIRBORNE, A MASK WITH AIR FILTER MAY BE REQUIRED.

Explosion hazard:

Explosiveness: NONFISSIONABLE

ENVIRONMENTAL HAZARDS

Pollution hazard:

Water pollution:

Persistency: 458 YEAR RADIOACTIVE HALF-LIFE; 20,000 DAY BIOLOGICAL HALF-LIFE IN TOTAL BODY, 73000 DAYS IN BONE, 24000 DAYS IN KIDNEYS, AND 3000 DAYS IN LIVER

Effect on water treatment process: 1. POSSIBILITY OF BUILD-UP OF RADIOACTIVITY IN WATER TREATMENT SLUDGE OR FILTERS 2. POSSIBILITY OF BUILD-UP OF RADIOACTIVITY IN SEWAGE TREATMENT SLUDGE 3. POSSIBLE TOXIC EFFECT ON SEWAGE TREATMENT BACTERIA.

Water uses threatened: ALL WATER USES

Industrial fouling potential: THE SAFE RADIATION LEVELS ARE BELOW INDUSTRIAL FOULING POTENTIAL LEVELS.

Air pollution: RADIOACTIVE HIGH

Food chain:

Potential for accumulation: THE CONCONCENTRATION OF RADIONUCLIDES IN AQUATIC AND MARINE ORGANISMS IS GOVERNED BY THESE FACTORS: 1) THE PARTICULAR ELEMENT INVOLVED AND ITS PHYSIOLOGICAL IMPORTANCE TO THE ORGANISM 2) THE PHYSICAL AND CHEMICAL STATE OF THE ELEMENT AND ITS POTENTIAL; ACCEPTABILITY TO THE SPECIFIC ORGANISM 3) THE CONCONCENTRATION OF THE ELEMENT IN THE ENVIRONMENT AND THE PRESENCE OF OTHER ELEMENTS THAT MAY INHIBIT OR ENHANCE ITS UPTAKE 4) THE MORPHOLOGY OF THE ORGANISM, ITS LIFE HISTORY, ITS CONDITION AND AGE, AND ITS PARTICULAR ROLE IN THE FOOD WEB AND 5) THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE ENVIRONMENT.

Aquatic toxicity:

Freshwater toxicity text (Conc. in ppm):

Conc.	Expos	Specie	Effect	Test Environment
	(Hr)			
8000		ALGAE	TLM	
25000		ALGAE	100%	
			MORTAL	
			ITY	
10000		PROTOZOA	TLM	
18000		PROTOZOA	100%	
			MORTAL	
			ITY	
5000		MOLLUSKS	TLM	
10000		MOLLUSKS	100%	
			MORTAL	
			ITY	
500		CRUSTACEA	TLM	
5000		CRUSTACEA	100%	
			MORTAL	
			ITY	
600		FISH	TLM	
2500	1344	RAINBOW TROUT	ALL	
			KILLED	

Toxicity to animals:

Animal toxicity text (Value in mg of material/kg body wt):

Value	Time	Species	Param.	Route
1400	10	DOG	LD50	
	R/DAY			
	6			
	DAY/W			
	EEK			
3500	10	RAT	LD50	
	R/DAY			
	6			
	DAY/W			
	EEK			
4400	8.8	MUS	LD50	
	R/DAY			
2300	8.8	GPG	LD50	
	R/DAY			

Livestock toxicity (ppm): 200

RANGE OF TOXICITY

Inhalation limit: 2.E-13
Inhalation limit text: (UC/CC)
Irritation levels: .00004
Irrigation levels text: UC/CC
Direct contact: REFER TO SPECIFIC COMPOUND
Direct human ingestion (mg/kgwt): 2280
Drinking water limits (ppm): .000004 .000004

HUMAN HEALTH HAZARDS

Acute hazard level: SOLUBLE: ORGAN OF REFERENCE MAXIMUM PERMISSIBLE 40 HOUR WEEK BURDEN IN TOTAL UCI/CM3 BODY(9), UCI MPC AIR, MPC WATER KIDNEY / .1 / 6.E-12/ 1.E-4 BONE / .05 / 6.E-12/1.E-4 LIVER / .4 / 9.E-12/2.E-4 TOTAL BODY / .3 / 2.E-11/2.E-4 GASTROINTESTINAL TRACT/ 0 / 2.E-7/ 8.E-4 INSOLUBLE: ORGAN OF REFERENCE MPC/W MPC/A LUNG / /10-10 GASTROINTESTINAL TRACT/ 8.E-4 /10-7
Public health hazard: HIGH, DUE TO EXPOSURE TO RADIATION
Action levels: NOTIFY LOCAL AIR AUTHORITIES AND THE NUCLEAR REGULATORY COMMISSION. DO NOT ENTER AREA WITHOUT RADIATION MONITORING EQUIPMENT.
Carcinogenicity: IONIZING RADIATION HAS THE POTENTIAL FOR BEING CARCINOGENIC.
Mutagenicity: EXPOSURE OF SEX CELLS TO IONIZING RADIATION CAN CAUSE GENE MUTATIONS TO OCCUR IN EXCESS OF THE SPONTANEOUS MUTATION RATE. POTENTIAL.
Teratogenicity: DEVELOPMENTAL DEFECTS HAVE BEEN OBSERVED IN EXPERIMENTAL ANIMALS EXPOSED TO IONIZING RADIATION. POTENTIAL.

CLEANUP PROCEDURES

In situ amelioration: 1. CATION EXCHANGE RESIN 2. LIME TREATMENT PLUS COAGULANT. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.
Beach/shore restoration: REMOVE THE SAND AND BURY AT AUTHORIZED BURIAL SITE.
Countermeasure material availability: CATION EXCHANGE RESIN - WATER SOFTENING AND CONDITIONING SUPPLIERS, WATER TREATMENT PLANTS; LIME - CEMENT PLANTS; COAGULANTS SUCH AS ALUMINUM SULFATE OR FERRIC SULFATE - WATER TREATMENT PLANTS
Disposal method(s): BURIAL AT AN AUTHORIZED RADIOACTIVE DISPOSAL SITE

Disposal notification(s): CONTACT THE NUCLEAR REGULATORY COMMISSION.

DATA ADEQUACY EVALUATION

GOOD

Attachment 2

Oil and Hazardous
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System

Beryllium

BERYLLIUM

CHRIS - Chemical Hazard Response Information System

Developed by the United States Coast Guard. 1985-2000.

Document Outline

- 0. OVERVIEW
- 1. CORRECTIVE RESPONSE ACTIONS
- 2. CHEMICAL DESIGNATIONS
- 3. HEALTH HAZARDS
- 4. FIRE HAZARDS
- 5. CHEMICAL REACTIVITY
- 6. WATER POLLUTION
- 7. SHIPPING INFORMATION
- 8. HAZARD CLASSIFICATIONS
- 9. PHYSICAL AND CHEMICAL PROPERTIES

0. OVERVIEW

Material name

BERYLLIUM
CHRIS Code BEM

Characteristics

Solid Silver color Odorless
Sinks in water.

Emergency Actions

Restrict access.
AVOID CONTACT WITH SOLID AND DUST,
Wear dust respirator and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Dust cloud may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry graphite, soda ash, or other inert powder.
DO NOT USE WATER ON FIRE.

Exposure

CALL FOR MEDICAL AID.

DUST

POISONOUS IF INHALED OR IF SKIN IS EXPOSED.

If inhaled will cause coughing or difficult breathing.

If in eyes, hold eyelids open and flush with plenty of water.

If breathing has stopped, give artificial respiration.

If breathing is difficult, give oxygen.

SOLID

POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.

Remove contaminated clothing and shoes.

Flush affected areas with plenty of water.

IF IN EYES, hold eyelids open and flush with plenty of water.

IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.

IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution - General

Effect of low concentrations on aquatic life is unknown.

May be dangerous if it enters water intakes.

Notify local health and wildlife officials.

Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

Collection Systems: Dredge

2. CHEMICAL DESIGNATIONS

CG Compatibility Group: Not listed.

Formula: Be

IMO/UN Designation: 6.1/1567

DOT ID Number: 1567

CAS Registry Number: 7440-41-7

NAERG Guide Number: 134

Standard Industrial Trade Classification: 52229

3. HEALTH HAZARDS

Personal Protective Equipment: Self contained positive pressure breathing apparatus; clean work clothes daily; gloves; eye protection

Symptoms Following Exposure: Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Dust is extremely toxic when inhaled; symptoms include coughing, shortness of breath, and acute or chronic lung disease. There is no record of illness from ingestion of beryllium. Contact with dust causes conjunctival inflammation of eyes and dermatitis.

Treatment of Exposure: INHALATION: acute disease may require hospitalization with administration of oxygen; chest x-ray should be taken immediately. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water; all cuts, scratches or other injuries should receive prompt medical attention.

TLV-TWA: 0.002 mg/m³

TLV-STEL: 0.01 mg/m³

TLV-Ceiling: Not listed.

Toxicity by Ingestion: Grade 3; oral LD⁵⁰ = 100 mg/kg (mouse)

Toxicity by Inhalation: Currently not available.

Chronic Toxicity: Berylliosis of lungs may occur from 3 months to 15 years after exposure. Chronic systemic diseases of the liver, spleen, lymph nodes, bone, kidney, and other organs may also occur.

Vapor (Gas) Irritant Characteristics: Currently not available

Liquid or Solid Irritant Characteristics: Currently not available

Odor Threshold: Odorless

IDLH Value: 4 mg/m³

OSHA PEL-TWA: 0.002 mg/m³

OSHA PEL-STEL: 0.025 mg/m³ 30 minute peak per 8 hour shift.

OSHA PEL Ceiling: 0.005 mg/m³

EPA AEGL: Not listed.

4. FIRE HAZARDS

Flash Point: Not pertinent

Flammable Limits in Air: Not pertinent

Fire Extinguishing Agents: Graphite, sand, or any other inert dry powder

Fire Extinguishing Agents NOT to Be Used: Water, CO₂, or halogenated extinguishing agents.

Special Hazards of Combustion Products: Combustion yields beryllium oxide fume, which is toxic if inhaled.

Behavior in Fire: Powder may form explosive mixture with air.

Ignition Temperature: Not pertinent

Electrical Hazard: Not pertinent

Burning Rate: Not pertinent

Adiabatic Flame Temperature: Currently not available

Stoichiometric Air to Fuel Ratio: 2.4 (calc.)

Flame Temperature: Currently not available

Combustion Molar Ratio (Reactant to Product): 1.0 (calc.)

5. CHEMICAL REACTIVITY

Reactivity with Water: No reaction

Reactivity with Common Materials: Reacts with acids and alkalis to form hydrogen gas.

Stability During Transport: Stable

Neutralizing Agents for Acids and Caustics: Not pertinent

Polymerization: Not pertinent

Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

Aquatic Toxicity: Currently not available

Waterfowl Toxicity: Currently not available

Biological Oxygen Demand (BOD): Currently not available

Food Chain Concentration Potential: Currently not available

GESAMP Hazard Profile:

Bioaccumulation: 0

Damage to living resources: 2

Human oral hazard: 2

Human contact hazard: II

Reduction of amenities: XXX

7. SHIPPING INFORMATION

Grades of Purity: Grade AA, 99.96+%; Grade A, 99.87+%; Nuclear grade

Storage Temperature: Ambient

Inert Atmosphere: No requirement
Venting: Open
IMO Pollution Category: Currently not available
Ship Type: Currently not available
Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

49 CFR Category: Poison
49 CFR Class: 6.1
49 CFR Package Group: II
Marine Pollutant: No
NFPA Hazard Classification: 4 1 0
EPA Reportable Quantity: 10 pounds
EPA Pollution Category: A
RCRA Waste Number: P015
EPA FWPCA List: Not listed

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State at 15 Degrees C and 1 ATM: Solid
Molecular Weight: 9.01
Boiling Point at 1 ATM: Not pertinent
Freezing Point: Not pertinent
Critical Temperature: Not pertinent
Critical Pressure: Not pertinent
Specific Gravity: 1.85 at 20°C (solid)
Liquid Surface Tension (Est.): Not pertinent
Liquid Water Interfacial Tension: Not pertinent
Vapor (Gas) Specific Gravity: Not pertinent
Ratio of Specific Heats of Vapor (Gas): Not pertinent
Latent Heat of Vaporization: Not pertinent
Heat of Combustion: -28,000 Btu/lb = -15,560 cal/g = -652 X 10⁵ J/kg
Heat of Decomposition: Not pertinent
Heat of Solution: Not pertinent
Heat of Polymerization: Not pertinent
Heat of Fusion: 260.0 cal/g
Limiting Value: Currently not available
REID Vapor Pressure: Currently not available